P O F

INSTRUCTION MANUAL

POWER SUPPLY

3650S SERIAL 408100

POWER DESIGNS, INC.
WESTBURY, N. Y.

POWER DESIGNS PACIFIC
PALO ALTO, CAL.

P O F

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MODEL 3650S SERIAL 608100

A D D E N D A

POWER SUPPLY
MODEL 3650S

1. ELECTRICAL PARTS LIST - THE FOLLOWING CHANGES AFFECT THE ELECTRICAL PARTS LIST:

   A. CHANGE DESCRIPTION OF C14 TO READ:

      CAPACITOR, ELECTROLYTIC, 35 UFD, 25 VDC

   B. CHANGE FACTORY PART NO. OF CR8

      FROM: WS241
      TO: TS121

   C. CHANGE FACTORY PART NO. OF T1

      FROM: TTM-46
      TO: TTM-66

   D. CHANGE FACTORY PART NO. OF CR1 AND CR2

      FROM: SR580
      TO: WS241

   E. CHANGE FACTORY PART NO. OF CR4

      FROM: DE310A
      TO: DE310C

   F. CHANGE VALUE OF R13

      FROM: 620Ω
      TO: 510Ω

2. SCHEMATIC DIAGRAM

   A. THE SCHEMATIC DIAGRAM HAS BEEN CHANGED TO REFLECT THE CHANGES GIVEN IN 1.D THROUGH 1.F.

   B. ON THE LOCATION OF COMPONENTS DRAWINGS

      REMOVE CR8 FROM FRONT VIEW OF AMPLIFIER BOARD. ADD CR8; STUD MOUNTED ON RIGHT CHASSIS FLANGE, MIDWAY BETWEEN CR1 AND CR2.

   C. CHANGE FACTORY PART NO. OF CR8

      FROM: SS44W
      TO: TS121

MODEL 3650S

INSTRUCTION MANUAL

1. GENERAL - MODEL 3650S IS A REGULATED DC POWER SOURCE SUITABLE FOR USE WITH LABORATORY AND INDUSTRIAL INSTRUMENTATION. THE EQUIPMENT SUPPLIES FROM 0 TO 36 VOLTS (REMOTELY PROGRAMMABLE) AT 5 AMPERES AND AUTOMATICALLY LIMITS THE LOAD CURRENT IF AN OVERLOAD SHOULD OCCUR. THE CURRENT LIMITING POINT IS ADJUSTED BY A FRONT PANEL CONTROL.

   THE UNIT IS VERY EASILY ADAPTED FOR REMOTE SENSING (COMPENSATION FOR LEAD LOSSES) OR REMOTE PROGRAMMING OF THE OUTPUT VOLTAGE MERELY BY MAKING THE APPROPRIATE CONNECTIONS TO THE REAR PANEL SCREW TERMINALS. A DISSIPATION MONITOR PROVIDES AUTOMATIC DERATING OF THE SUPPLY WHEN REMOTE PROGRAMMING IS USED. SILICON SEMICONDUCTORS ARE USED THROUGHOUT FOR OPTIMUM TEMPERATURE STABILITY AND RELIABILITY.

   THE POWER SUPPLY IS HOUSED IN A PORTABLE CABINET DESIGNED FOR BENCH USE. RACK ADAPTERS ARE AVAILABLE FOR MOUNTING UP TO THREE UNITS IN A 19" RACK.

2. SPECIFICATIONS

   2.1 ELECTRICAL

   2.1.1 INPUT: 105 TO 125 V, 55-440 CPS, SINGLE PHASE

   2.1.2 OUTPUT: 0 TO 36 VDC, 0 TO 5 AMPERES, CONTINUOUSLY ADJUSTABLE.

   2.1.3 REGULATION: LESS THAN 0.01% PLUS 3 MV FOR LINE VOLTAGE VARIATIONS OF ±10% OR 100% CHANGES IN RATED LOAD.

   2.1.4 RIPPLE AND NOISE: LESS THAN 500 μV RMS AT 60 CPS AND LESS THAN 1 MV RMS.

   2.1.5 RECOVERY TIME: LESS THAN 50 μSECONDS TO RETURN WITHIN REGULATION LIMITS FOR A 10% TO 100% OR 100% TO 10% STEP CHANGE IN RATED LOAD.

   2.1.6 STABILITY: LESS THAN 0.01% PLUS 5 MV PER 8-HOUR PERIOD, AFTER WARM-UP AND WITH A CONSTANT LINE VOLTAGE, LOAD AND AMBIENT TEMPERATURE. (USING EXTERNAL LOW TEMPERATURE COEFFICIENT PROGRAMMING RESISTOR).

   2.1.7 TEMPERATURE COEFFICIENT: .02% +2 MV PER °C.

   2.1.8 REMOTE PROGRAMMING RESISTANCE/OUTPUT VOLTAGE RATIO: 200Ω/V NOMINAL.

   2.1.9 SOURCE IMPEDANCE: LESS THAN 0.020Ω TO 20 KC, 0.15Ω TO 100KC, AND 1.5Ω TO 1 MC. (FRONT TERMINAL IMPEDANCES WILL BE APPROXIMATELY 50% HIGHER).

2.1.10 CIRCUIT PROTECTION: A DISSIPATION MONITORING CIRCUIT PREVENTS THE SERIES PASS TRANSISTOR POWER DISSIPATION FROM EXCEEDING A SAFE VALUE.

2.1.11 CURRENT LIMITING: 0 TO 5 AMPERES, CONTINUOUSLY ADJUSTABLE.

2.1.12 OPERATING TEMPERATURE: 0 TO 60°C

2.1.13 OUTPUT POLARITY: EITHER OUTPUT TERMINAL MAY BE CONNECTED TO GROUND. THE MAXIMUM POTENTIAL BETWEEN ANY TERMINAL AND GROUND MUST NOT EXCEED 500 V.

2.2 MECHANICAL

2.2.1 WIDTH: 7-3/4"

2.2.2 HEIGHT: 8-3/4"

2.2.3 LENGTH: 14½" BEHIND FRONT PANEL

2.2.4 WEIGHT: 33 LBS.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

3. OPERATION AND INSTALLATION - NO PRELIMINARY INSPECTION OR PROCESSING IS REQUIRED. THE POWER SUPPLY IS READY FOR OPERATION AS SHIPPED FROM THE FACTORY.

3.1 PRELIMINARY

3.1.1 CONNECT THE LINE CORD TO A 105 TO 125 V, 55 TO 440 CPS SOURCE.

3.1.2 ROTATE THE CURRENT CONTROL FULLY CW.

3.1.3 SET THE METER FUNCTION SWITCH TO V AND ADJUST THE VOLTAGE AND FINE VOLTAGE CONTROLS UNTIL THE PANEL METER INDICATES THE DESIRED OUTPUT VOLTAGE.

3.1.4 THE LOAD MAY NOW BE CONNECTED TO EITHER FRONT OR REAR PANEL DC+ AND DC- TERMINALS.

3.2 CURRENT LIMITING

3.2.1 ROTATE THE CURRENT CONTROL FULLY CCW. READJUST THE CURRENT CONTROL CW UNTIL THE LIMIT LIGHT JUST GOES OUT.

3.3 SENSING - THE POINTS TO WHICH THE SENSING LEADS ARE CONNECTED ARE THE POINTS BETWEEN WHICH OPTIMUM REGULATION IS OBTAINED. WHEN THE OUTPUT VOLTAGE IS SENSED AT THE OUTPUT TERMINALS, THE VOLTAGE ACROSS THE LOAD WILL BE:

$$V_L = V_{OUT} - I_L \times R_{LW}$$

WHERE: V_{OUT} = SUPPLY OUTPUT VOLTAGE
V_L = VOLTAGE ACROSS THE LOAD
I_L = LOAD CURRENT
R_{LW} = RESISTANCE OF WIRES CONNECTED BETWEEN THE POWER SUPPLY AND LOAD

WHEN SHIPPED THE UNIT IS CONNECTED FOR LOCAL SENSING, I.E. THE SENSING TERMINALS ARE CONNECTED TO THE OUTPUT TERMINALS. HOWEVER, IF REMOTE SENSING IS DESIRED, DUE TO LARGE VOLTAGE DROPS OR NOISE PICKUP IN THE CONNECTING WIRES, PROCEED AS DETAILED IN PARAGRAPHS 3.3.1 AND 3.3.2.

3.3.1 DISCONNECT THE WIRES BETWEEN THE S+, S-, DC+ AND DC- TERMINALS. CONNECT THE S+ TERMINAL TO THE POSITIVE SIDE OF THE LOAD. CONNECT THE S- TERMINAL TO THE NEGATIVE SIDE OF THE LOAD.

3.3.2 THE WIRES BETWEEN THE SENSING TERMINALS AND THE LOAD SHOULD BE TWISTED TOGETHER. IF MORE THAN 6 FT. OF WIRE IS USED, A 20 UFD, 65 VDC CAPACITOR SHOULD BE CONNECTED ACROSS THE SENSING TERMINALS.

3.4 REMOTE VOLTAGE PROGRAMMING - THIS FEATURE ALLOWS THE OUTPUT VOLTAGE OF THE SUPPLY TO BE CONTROLLED REMOTELY. HOWEVER, DUE TO THE TYPE OF REGULATOR USED IN THE SUPPLY, THE PROGRAMMING RANGE IS LIMITED BY THE POWER DISSIPATION IN THE SERIES PASS TRANSISTORS. THE CURVE PRINTED ON THE REAR PANEL OF THE UNIT SHOWS PROGRAMMABLE RANGES FOR THE THREE SETTINGS OF THE VOLTAGE CONTROL. FOR EXAMPLE, IF THE VOLTAGE CONTROL IS SET FOR 36 VDC OUTPUT, THE SUPPLY MAY BE PROGRAMMED FROM 31 VDC TO 38 VDC WITH A 5 AMPERE LOAD OR FROM 15 VDC TO 43 VDC WITH A 2.5 AMPERE LOAD. THE DISSIPATION MONITOR WILL AUTOMATICALLY LIMIT THE SERIES PASS DISSIPATION IF OPERATION OUTSIDE THE SAFE AREA IS ATTEMPTED. THE LIMIT LIGHT WILL GO ON WHEN THE MONITOR OPERATES.

NOTE: THE PROGRAMMING TERMINALS ARE SENSITIVE TO NOISE AND HUM PICKUP. A SHIELDED, TWISTED PAIR OF WIRES SHOULD BE USED TO CONNECT THE PROGRAMMING RESISTOR TO THE TERMINALS. THE SHIELD MUST BE CONNECTED TO THE CHASSIS OF THE UNIT. LOCATE THE RESISTOR AWAY FROM FIELDS CAUSED BY SOLENOIDS, RADIO TRANSMITTERS, ETC.

3.4.1 ADJUST THE VOLTAGE CONTROL UNTIL THE PANEL METER INDICATES THE OUTPUT VOLTAGE CLOSEST TO THAT AT WHICH THE SUPPLY WILL BE PROGRAMMED. SET THE AC SWITCH TO OFF.

3.4.2 DISCONNECT THE JUMPER BETWEEN THE RV1 AND RV2 TERMINALS. CONNECT THE PROGRAMMING RESISTANCE BETWEEN THE RV1 AND S- TERMINALS. THE VALUE OF THIS RESISTANCE IS GIVEN BY:

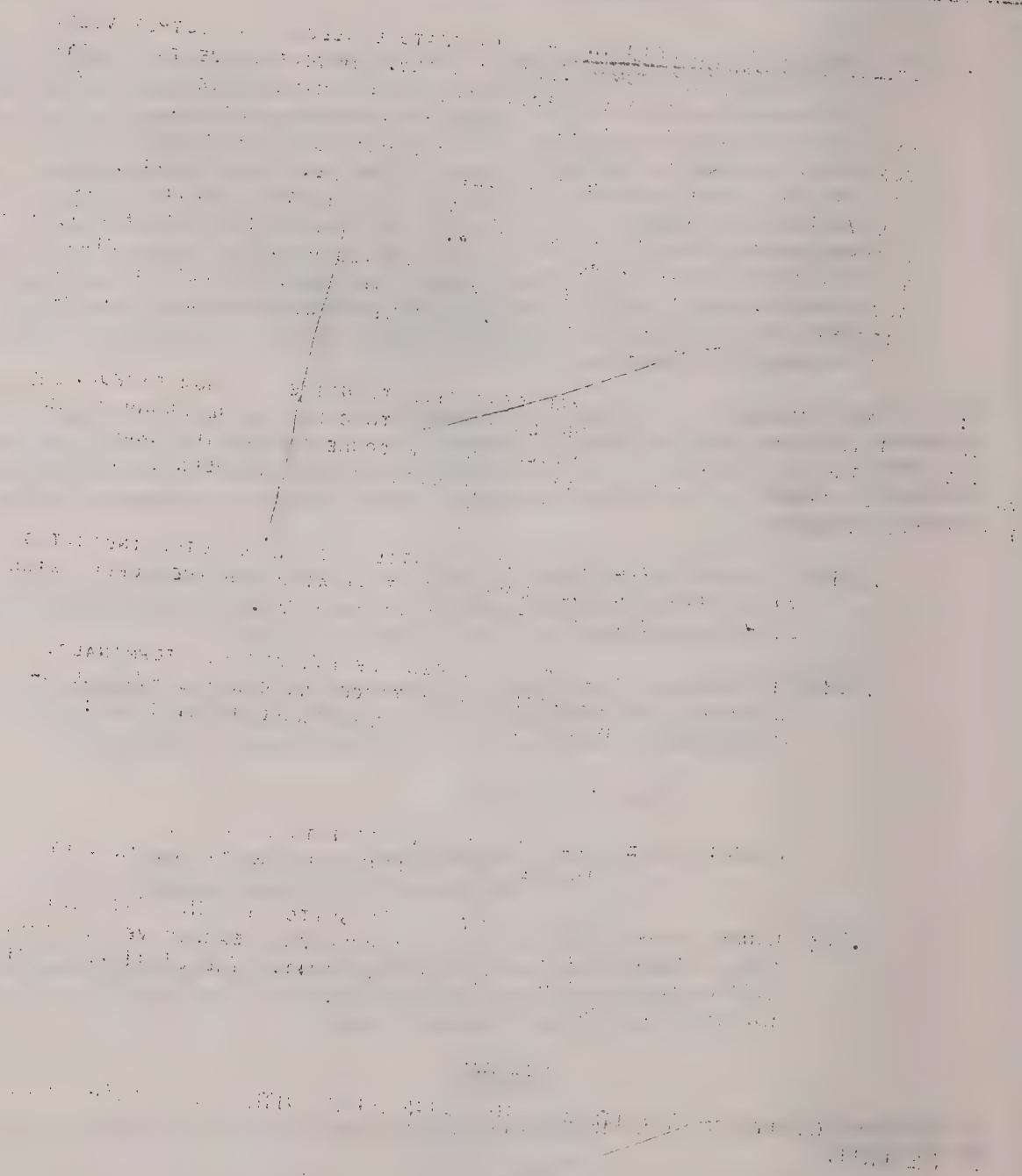
$$R_P = V_O \times 200$$

WHERE: R_P = THE PROGRAMMING RESISTANCE IN OHMS
V_O = THE DESIRED OUTPUT VOLTAGE CHANGE IN VOLTS

3.4.3 CONNECT THE LOAD AND SET THE AC SWITCH TO ON. THE SERIES PASS TRANSISTORS WILL BE PROTECTED FROM EXCESSIVE DISSIPATION BY THE DISSIPATION MONITORING CIRCUIT. THE LIMIT LAMP WILL LIGHT IF AN OVERLOAD SHOULD OCCUR.

CAUTION

DO NOT MAKE CHANGES TO THE PROGRAMMING CONNECTIONS WITH LINE VOLTAGE APPLIED TO THE UNIT.



4. THEORY OF OPERATION

4.1 GENERAL - MODEL 3650S USES A CONVENTIONAL SERIES REGULATOR TO CONTROL THE OUTPUT FROM A VARIABLE VOLTAGE FULL-WAVE RECTIFIER, SERIES PASS TRANSISTORS, Q1 THROUGH Q4, ACT AS THE CONTROL ELEMENTS. THE VOLTAGE DROP ACROSS THESE TRANSISTORS IS ADJUSTED BY A HIGH GAIN, DC AMPLIFIER SO AS TO MAINTAIN THE OUTPUT VOLTAGE AT SOME PRESET LEVEL. THE DISSIPATION LIMITING CIRCUIT CONTINOUSLY MONITORS THE SERIES PASS POWER DISSIPATION AND LIMITS IT IF AN OVERLOAD SHOULD OCCUR. OPERATING VOLTAGES FOR THE DC AMPLIFIER AND POWER MONITORING CIRCUITS ARE DERIVED FROM AN AUXILIARY REGULATOR.

4.2 UNREGULATED SOURCE - THE OUTPUT FROM TRANSFORMERS T3 AND T1 IS RECTIFIED BY DIODES CR1 AND CR2 AND SMOOTHED BY CAPACITOR C3.

4.3 SERIES PASS ELEMENT - SERIES PASS TRANSISTORS Q1 THROUGH Q4 ARE CONNECTED IN PARALLEL. BASE DRIVE IS PROVIDED BY Q5 CONNECTED AS A DARLINGTON AMPLIFIER.

4.4 CONTROL AMPLIFIER - TRANSISTOR Q10 COMPARES THE DC OUTPUT VOLTAGE WITH THE VOLTAGE ACROSS REFERENCE ZENER CR14. AN INCREASE IN OUTPUT VOLTAGE WILL CAUSE Q10 COLLECTOR CURRENT TO FALL AND THUS REDUCE THE COLLECTOR CURRENT OF Q9. THIS IN TURN WILL REDUCE THE COLLECTOR CURRENTS OF Q5 AND THE SERIES PASS NETWORK AND THE OUTPUT VOLTAGE WILL FALL. COMPENSATION FOR LOAD CURRENT CHANGES IS PROVIDED BY R18 AND R27. CR6 COMPENSATES FOR TEMPERATURE EFFECTS.

4.5 DISSIPATION MONITOR - Q7 MONITORS THE VOLTAGE ACROSS THE SERIES PASS TRANSISTORS. Q8 MONITORS THE VOLTAGE ACROSS LOAD CURRENT SENSING RESISTOR R19. SHOULD EITHER OF THESE VOLTAGES RISE ABOVE THE LEVEL SET BY THE APPROPRIATE POTENTIOMETER, R14 OR R24 AND R16, Q7 AND Q8 WILL START TO CONDUCT AND PREVENT THE LOAD CURRENT FROM RISING FURTHER.

4.6 AUXILIARY REGULATOR - ZENER DIODE CR12 PROVIDES REGULATED 20 VDC FOR THE SEMICONDUCTORS IN THE CONTROL AMPLIFIER AND DISSIPATION MONITOR. ZENER DIODE CR14 PROVIDES THE REFERENCE VOLTAGE FOR THE CONTROL AMPLIFIER AND ANY CHANGE IN THE REFERENCE WILL BE REFLECTED IN THE OUTPUT VOLTAGE. TO MINIMIZE THESE CHANGES Q11 AND CR13 MAINTAIN A CONSTANT CURRENT THROUGH CR14 AND ARE COMPENSATED AGAINST LINE VOLTAGE AND TEMPERATURE CHANGES.

4.7 LIMIT INDICATOR - WHEN THE UNIT IS IN THE CURRENT OR DISSIPATION LIMITING MODE, Q10 WILL BE IN SATURATION AND Q12 WILL BE CUT OFF AS A RESULT. THIS WILL ALLOW LAMP 12 TO LIGHT. AS SOON AS Q10 COMES OUT OF SATURATION, Q12 WILL START TO CONDUCT AND THE LAMP WILL NO LONGER HAVE SUFFICIENT VOLTAGE TO SUSTAIN IONISATION.

4.8 PHASE SHIFT NETWORKS - EACH TRANSISTOR AND ITS ASSOCIATED CIRCUITRY WILL INTRODUCE SOME PHASE SHIFT. NETWORKS SUCH AS R23 AND C6 CORRECT THE GAIN AND PHASE SHIFT OF THE DC AMPLIFIER AND PREVENT OSCILLATION.

5. MAINTENANCE

5.1 PREVENTATIVE MAINTENANCE - UNDER NORMAL CONDITIONS NO SPECIAL MAINTENANCE OF THE POWER SUPPLY IS REQUIRED AND THE UNIT WILL PROVIDE TROUBLE-FREE SERVICE FOR MANY YEARS. HOWEVER, THE CHARACTERISTICS OF SEMICONDUCTOR COMPONENTS DO CHANGE WITH AGE AND IT IS DESIRABLE TO PERFORM THE FOLLOWING PROCEDURES AT SIX-MONTHLY INTERVALS.

5.1.1 MAXIMUM VOLTAGE ADJUSTMENT

5.1.1A ROTATE THE VOLTAGE AND CURRENT CONTROLS FULLY CW. ROTATE THE FINE VOLTAGE CONTROL FULLY CCW.

5.1.1B CONNECT THE LINE CORD TO A 115 VAC SUPPLY. SET THE AC SWITCH TO ON. SET THE METER FUNCTION SWITCH TO V.

5.1.1C ADJUST TRIMMER POTENTIOMETER R30 UNTIL THE PANEL VOLTMETER READS 36 VOLTS.

5.1.2 LOAD REGULATION

5.1.2A REPEAT STEPS 5.1.1A AND B.

5.1.2B CONNECT A DIFFERENTIAL OR DIGITAL VOLIMETER BETWEEN THE +S AND -S TERMINALS.

5.1.2C CONNECT THE LINE CORD TO A 115 VAC SUPPLY AND SET THE AC SWITCH TO ON.

5.1.2D NOTE THE VOLTMETER READING.

5.1.2E CONNECT A 7.2Ω, 200 WATT LOAD BETWEEN THE REAR PANEL DC+ AND DC- TERMINALS. ADJUST POTENTIOMETER R18 UNTIL THE VOLTMETER READING IS THE SAME AS THAT NOTED IN STEP D.

5.1.3 METER CALIBRATION

5.1.3A ENERGIZE THE POWER SUPPLY. SET THE METER FUNCTION SWITCH TO A.

5.1.3B CONNECT A 0 TO 10 AMPERE AMMETER IN SERIES WITH A 7.2Ω, 200 WATT LOAD BETWEEN THE DC+ AND DC- TERMINALS.

5.1.3C ADJUST THE VOLTAGE AND CURRENT CONTROLS UNTIL THE AMMETER INDICATES 5 AMPERES.

5.1.3D ADJUST POTENTIOMETER R34 UNTIL PANEL METER INDICATES 5 AMPERES.

5.1.4 DISSIPATION LIMITER ADJUSTMENT

5.1.4A ENERGIZE THE POWER SUPPLY. SET THE METER FUNCTION SWITCH TO A. ROTATE THE CURRENT CONTROL FULLY CW.

5.1.4B CONNECT A 0-50 VDC METER BETWEEN THE COLLECTOR AND EMITTER OF Q1. SHORT CIRCUIT THE DC+ AND DC- TERMINALS.

5.1.4C ADJUST THE VOLTAGE CONTROL UNTIL THE PANEL METER READS 1.5 AMPERES.

5.1.4D ADJUST R14 UNTIL THE VOLTMETER READS 50 V.

5.1.4E REPEAT STEPS C AND D UNTIL NO FURTHER ADJUSTMENTS ARE NECESSARY.

5.1.5 CURRENT LIMITER ADJUSTMENT

5.1.5A ENERGIZE THE POWER SUPPLY. ROTATE THE VOLTAGE AND CURRENT CONTROLS FULLY CW.

5.1.5B CONNECT A 0-10 AMPERE METER IN SERIES WITH A 6Ω, 250 WATT LOAD BETWEEN THE DC+ AND DC TERMINALS.

5.1.5C ADJUST R24 UNTIL THE AMMETER INDICATES 5.5 AMPERES.

APPENDIX

1. INTRODUCTION

This appendix contains an electrical parts list, schematic diagram, parts-location diagram, and equipment warranty.

2. ELECTRICAL PARTS LIST

All electrical and electronic parts are listed in the sequence of their circuit numbers, as shown on the schematic diagram. A brief description of each part is given, followed by the code number of the manufacturer and his part number. All manufacturers' code numbers are taken from Cataloging Handbooks H4-1 and H4-2, Federal Supply Code for Manufacturers. These handbooks are available through Federal Agencies. They may also be ordered directly from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

It is recommended that all parts having the code number 98095 be ordered directly from Power Designs, Inc. The commercial equivalents of these parts have either wide parameter tolerances or require special factory inspection or modification before they are suitable for use in the power supply.

All components used in the power supply, or supplied as replacements, are carefully inspected at the factory. Inspections are performed on a 100% basis or at AQL levels in accordance with Military Specification Mil-Q-9858, under which Power Designs, Inc. has been qualified.

All semiconductors are inspected on a 100% basis. They are inspected not only for operating parameters, but also for critical characteristics related to reliability and predictable life expectancy. Some of these characteristics are observed when the device is taken beyond its normal operating regions. These test techniques have been developed under a "predictable-reliability" program in operation at Power Designs, Inc. for the past ten years. Under this program, quality-control procedures are constantly reevaluated and updated as new advances are made in solid-state technology and additional experience is gleaned from field history.

Semiconductor manufacturers are constantly modifying their products. Complete lines are frequently discontinued, to be replaced by devices having improved gain, operating voltage levels, and frequency response. The high-gain, closed-loop DC amplifiers used in regulator circuits are particularly sensitive to even slight changes in these parameters. Commercial or military "equivalent" transistors used as replacements may affect the power supply performance. Compliance with the original specifications can be assured if replacement semiconductors are ordered from the factory.

All replacement semiconductors are processed and stocked at the factory to insure complete interchangeability with the devices in the original equipment. To insure that proper replacements are provided, the original devices are coded with a Power Designs, Inc. part number as follows:

FS	696	A
Semiconductor manufacturer's code	Power Designs, Inc. type	Suffix identifying special parameters

When ordering replacements, please identify the device as completely as possible, listing the model and serial number if available.

In some cases, the replacement part received may have a different part number from that given in the electrical parts list. This can be due to several factors:

a. A different prefix indicates that Power Designs, Inc. is using a different vendor source. The operating characteristics of the devices are identical.

b. A completely different part number indicates:

1. The original vendor discontinued manufacture of the item or could no longer manufacture it to the original specifications.

2. A better device for use in the particular circuit has been substituted.

3. Tighter controls for interchangeability have provided greater assurance of improved reliability with the new replacement.

NOTE: When replacing semiconductors or investigating their part numbers, note the information presented in paragraph 2 above.

ELECTRICAL PARTS LIST

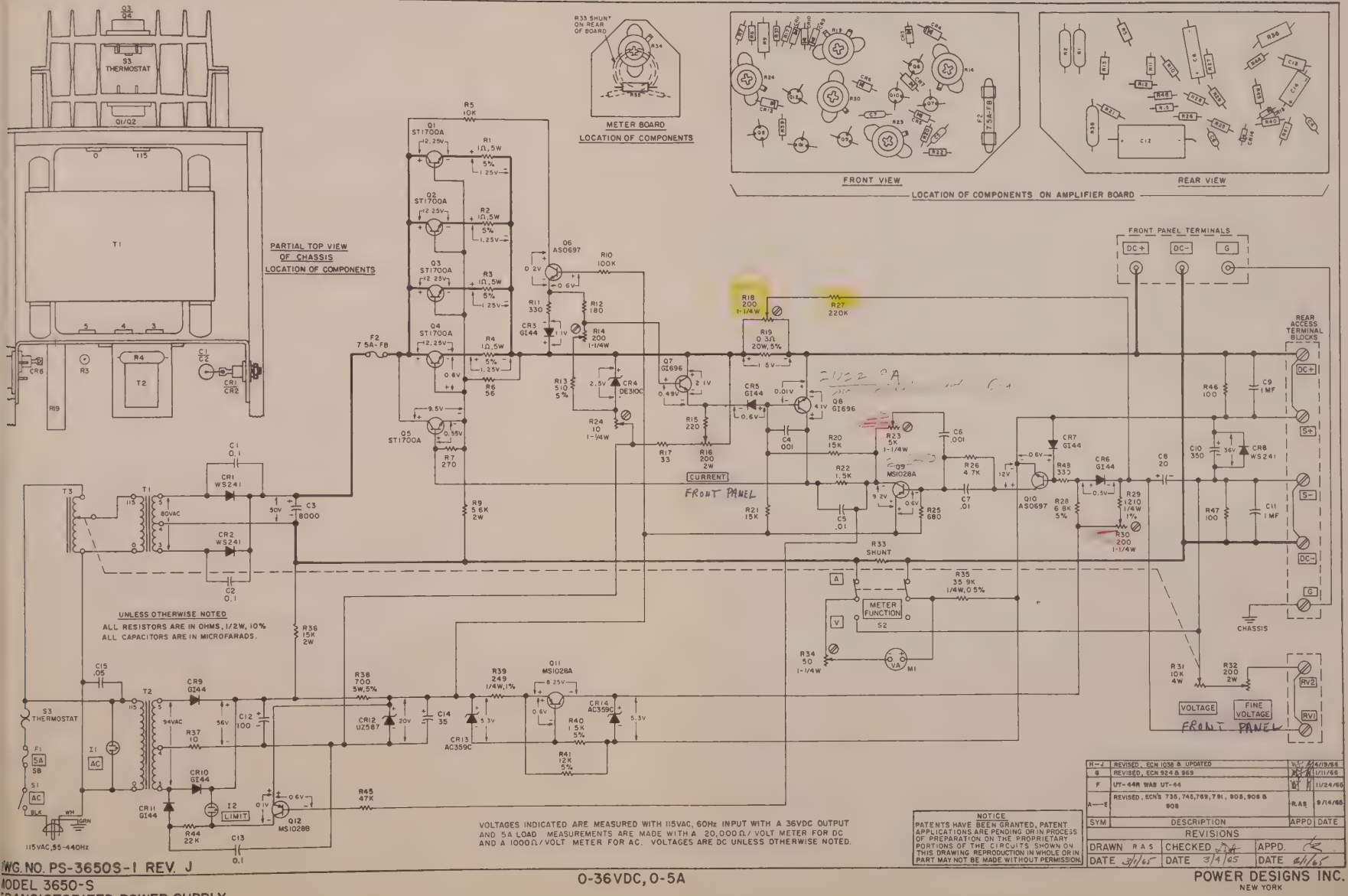
Circuit Number	Description	Mfr Code No.	Part Number
C1, C2	Capacitor, plastic film, 0.1 uf, 200 vdc	98095	CP-17-2
C3	Capacitor, electrolytic, 8000 uf, 60 vdc	98095	CE-76-.6
C4	Capacitor, plastic film, 0.001 uf, 200 vdc	98095	CP-24-2
C5	Capacitor, plastic film, 0.01 uf, 200 vdc	98095	CP-16-2
C6	Capacitor, plastic film, 0.001 uf, 200 vdc	98095	CP-24-2
C7	Capacitor, plastic film, 0.01 uf, 200 vdc	98095	CP-16-2
C8	Capacitor, electrolytic, 20 uf, 100 vdc	98095	CE-103-1
C9	Capacitor, ceramic disc, 1 uf, 3 vdc	98095	CC-100M3AD
C10	Capacitor, electrolytic, 350 uf, 85 vdc	98095	CE-47-.85LT
C11	Capacitor, ceramic disc, 1 uf, 3 vdc	98095	CC-100M3AD
C12	Capacitor, electrolytic, 100 uf, 80 vdc	98095	CE-91-.8
C13	Capacitor, plastic film, 0.1 uf, 200 vdc	98095	CP-17-2
C14	Capacitor, electrolytic, 35 uf, 25 vdc	98095	CE-16-.25
C15	Capacitor, ceramic disc, 0.05 uf, 600 vdc	98095	CC-34-6
CR1, CR2	Diode, silicon, rectifier	98095	WS241
CR3	Diode, silicon, rectifier	98095	GI44
CR4	Diode, silicon, zener	98095	DE310C
CR5 thru CR7	Diode, silicon, rectifier	98095	GI44
CR9 thru CR11	Diode, silicon, rectifier	98095	GI44
CR8	Diode, silicon, rectifier	98095	WS241
CR12	Diode, silicon, zener	98095	UZ587
CR13, CR14	Diode, silicon, zener	98095	AC359C or D
F1	Fuse, "Slo Blo", 5 amp.	71400	MDX 5
F2	Fuse, "Fast Blo," 7½ amp.	71400	AGC 7½
I1	Lamp assy, neon	98095	PLA-7
I2	Lamp assy, neon	98095	PLA-8A
M1	Meter, dual scale, 0-36 v/0-5 amp.	98095	MVA-100
Q1 thru Q5	Transistor, silicon, NPN	98095	ST1700A
Q6	Transistor, silicon, NPN	98095	AS0697
Q7, Q8	Transistor, silicon, NPN	98095	GI696 or MS696
Q9	Transistor, silicon, PNP	98095	MS1028A
Q10	Transistor, silicon, NPN	98095	AS0697

Circuit Number	Description	Mfr Code No.	Part Number
Q11	Transistor, silicon, PNP	98095	MS1028A
Q12	Transistor, silicon, PNP	98095	MS1028B or MS1075
R1 thru R4	Resistor, wirewound, 1 Ω ± 5%, 5 w	98095	RW-010-3RA
R5	Resistor, composition, 10 k Ω ± 10%, ½ w	01121	EB1031
R6	Resistor, composition, 56 Ω ± 10%, ½ w	01121	EB5601
R7	Resistor, composition, 270 Ω ± 10%, ½ w	01121	EB2711
R9	Resistor, composition, 5.6 k Ω ± 10%, 2 w	01121	HB5621
R10	Resistor, composition, 100 k Ω ±10%, ½ w	01121	EB1041
R11	Resistor, composition, 330 Ω ± 10%, ½ w	01121	EB3311
R12	Resistor, composition, 180 Ω ± 10%, ½ w	01121	EB1811
R13	Resistor, composition, 510 Ω ± 5%, ½ w	01121	EB5115
R14	Resistor, wirewound, adjustable, 200 Ω ±10%, 1¼ w	98095	RWT-201-C4
R15	Resistor, composition, 220 Ω ± 10%, ½ w	01121	EB2211
R16	Resistor, wirewound, adjustable, 200 Ω ±10%, 2 w	98095	RWV-201C4-.87
R17	Resistor, composition, 33 Ω ± 10%, ½ w	01121	EB3301
R18	Resistor, wirewound, adjustable, 200 Ω ±10%, 1¼ w	98095	RWT-201-C4
R19	Resistor, wirewound, 0.3 Ω ±5%, 20 w	98095	RW-001-3F
R20, R21	Resistor, composition, 15 k Ω ± 10%, ½ w	01121	EB1531
R22	Resistor, composition, 1.5 k Ω ± 10%, ½ w	01121	EB1521
R23	Resistor, wirewound, adjustable, 5 k Ω ±10%, 1¼ w	98095	RWT-502-C4
R24	Resistor, wirewound, adjustable, 10 Ω ±10%, 1¼ w	98095	RWT-100-C4
R25	Resistor, composition, 680 Ω ± 10%, ½ w	01121	EB6811
R26	Resistor, composition, 4.7 k Ω ± 10%, ½ w	01121	EB4721
R27	Resistor, composition, 220 k Ω ±10%, ½ w	01121	EB2241
R28	Resistor, composition, 6.8 k Ω ±5%, ½ w	01121	EB6825
R29	Resistor, precision, 1210 Ω ±1%, ¼ w	16299	Type NA60
R30	Resistor, wirewound, adjustable, 200 Ω ±10%, 1¼ w	98095	RWT-201-C4
R31	Resistor, wirewound, variable, 10 k Ω ±10%, 4 w	98095	RWV-103M4-5.06
R32	Resistor, wirewound, variable, 200 Ω ±10%, 2 w	98095	RWV-201C4-.87
R33	Resistor, wirewound, 0.2 Ω ±10%	98095	RWF00020
R34	Resistor, wirewound, adjustable, 50 Ω ±10%, 1¼ w	98095	RWT-500-C4
R35	Resistor, precision, 35.9 Ω ±0.5%, ¼ w	16299	Type NA60
R36	Resistor, composition, 15 k Ω ± 10%, 2 w	01121	HB1531

Circuit Number	Description	Mfr Code No.	Part Number
R37	Resistor, composition, 10 Ω ±10%, ½ w	01121	EB1001
R38	Resistor, wirewound, 700 Ω ± 5%, 5 w	98095	RW-701-3RA
R39	Resistor, precision, 249 Ω ± 1%, ¼ w	16299	Type NA60
R40	Resistor, composition, 1.5 k Ω ±5%, ½ w	01121	EB1525
R41	Resistor, composition, 12 kΩ ±5%, ½ w	01121	EB1235
R44	Resistor, composition, 22 kΩ ±10%, ½ w	01121	EB2231
R45	Resistor, composition, 47 kΩ ±10%, ½ w	01121	EB4731
R46, R47	Resistor, composition, 100 Ω ±10%, ½ w	01121	EB1011
R48	Resistor, composition, 330Ω ±10%, ½ w	01121	EB3311
S1	Switch, toggle, SPST	98095	ST-5
S2	Switch, toggle, DPDT	98095	ST-16
S3	Switch, thermal	98095	STH-2
T1	Transformer, power	98095	TTM-66
T2	Transformer, auxiliary	98095	TTH-27
T3	Transformer, variable	98095	TTV-3

CODE LIST OF MANUFACTURERS

Code No.	Manufacturer	Address
98095	Power Designs Inc.	Westbury, N. Y.
71400	Bussman Manufacturing Div.	Los Angeles, Calif.
16299	Corning Glass Works Electronic Components Div.	Raleigh, N. C.
01121	Allen-Bradley Co.	Milwaukee, Wisconsin


PARTIAL TOP VIEW OF CHASSIS LOCATION OF COMPONENTS
METER BOARD LOCATION OF COMPONENTS
R33 SHUNT ON REAR OF BOARD
FRONT VIEW
REAR VIEW
LOCATION OF COMPONENTS ON AMPLIFIER BOARD
FRONT PANEL TERMINALS
DC+
DC-
G
REAR ACCESS TERMINAL BLOCKS
S+
S-
CHASSIS
CURRENT
FRONT PANEL
VOLTAGE
FINE VOLTAGE
FRONT PANEL
METER FUNCTION
S2
UNLESS OTHERWISE NOTED
ALL RESISTORS ARE IN OHMS, 1/2W, 10%
ALL CAPACITORS ARE IN MICROFARADS.
VOLTAGES INDICATED ARE MEASURED WITH 115VAC, 60Hz INPUT WITH A 36VDC OUTPUT AND 5A LOAD MEASUREMENTS ARE MADE WITH A 20,000Ω/VOLT METER FOR DC AND A 1000Ω/VOLT METER FOR AC. VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
115VAC, 55-440Hz

SYM	DESCRIPTION	APPD	DATE
H-J	REVISED, ECN 1038 & UPDATED		4/19/66
G	REVISED, ECN 924 & 969		1/11/66
F	UT-44R WAS UT-44		11/24/65
A—E	REVISED, ECN'S 735, 748, 769, 791, 905, 906 & 908	R.A.S	9/14/65

REVISIONS

DRAWN	CHECKED	APPD.
R A S		
DATE 3/1/65	DATE 3/4/65	DATE 3/1/65

NOTICE
PATENTS HAVE BEEN GRANTED, PATENT APPLICATIONS ARE PENDING OR IN PROCESS OF PREPARATION ON THE PROPRIETARY PORTIONS OF THE CIRCUITS SHOWN ON THIS DRAWING. REPRODUCTION IN WHOLE OR IN PART MAY NOT BE MADE WITHOUT PERMISSION.

DWG. NO. PS-3650S-1 REV. J

MODEL 3650-S
TRANSISTORIZED POWER SUPPLY

0-36VDC, 0-5A

POWER DESIGNS INC.
NEW YORK

WARRANTY

POWER DESIGNS INC., warrants to the original purchaser, each instrument sold by us, or our authorized agents, and all the parts thereof, to be free from defects in material or workmanship under normal use and service within the specified ratings and operating conditions.

Its obligation under this warranty is hereby limited to the repair or replacement of any instrument, or part thereof, which is returned to us within one year after delivery, and which shall prove, after our examination, to be thus defective.

This warranty does not include the cost of transportation charges to and from the factory and/or the cost of packaging or crating of instruments for return to the factory, unless such instrument is returned within thirty (30) days from the date of original shipment as shown on the packing list or shipping documents, and prior written authorization for such costs is obtained from the factory.

The repair or replacement of an instrument, or any part thereof, does not void or extend the original warranty.

POWER DESIGNS INC., reserves the right to discontinue any instrument without notice, or to make modifications in design at any time, without incurring any obligation to make these modifications in instruments previously sold.

POWER DESIGNS INC.
Westbury, L. I., New York

POWER DESIGNS PACIFIC, INC.
Palo Alto, California

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